X-3 SRW

Network Working Group
Request for Comments # 466
NIC # 14740
Categories: TELNET

Joel M. Winett
LL-67
February 27, 1973

TELNET LOGGER/SERVER For Host LL-67

The attached writeup documents the TELNET LOGGER/SERVER for the CP/CMS system on the Lincoln Laboratory 360/67 (host 10). The facility serves both half duplex and full duplex TELNET users with data in either ASCII or EBCDIC codes.

Use of the hide-your-input and noecho TELNET controls are used for the EBCDIC print suppress (bypass) and print restore features during the login procedure. To support half duplex terminals, the TELNET control break (reverse break) is sent as an input prompt when input is desired. This code can also be used to indicate that a previous line sent without an end of line sequence (CR-LF) should be printed.

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Operation of the Lincoln Laboratory CP/CMS TELNET LOGER/SERVER

ICP Connection

The TELNET LOGGER/SERVER follows the ICP protocol for making a pair of connections. The LOGGER is initially enabled for a connection on socket X'00000001'. When an RFC is received for this socket a pair of sockets will be chosen for the TELNET connections. If the maximum number of TELNET users which can be served are active, the initial connection is refused. Currently, three TEINET users can be served.

TELNET LOGGER

After the ICP connections have been setup, the LOGGER expects a TELNET data type code, a string of network ASCII characters, or a null line (just CR-LF) to indicate whether its operation should be in ASCII or in EBCDIC character codes. ASCII is assumed unless the first bype received is the TELNET EBCDIC data type code (X'A2). When something has been received, the message:

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will be transmitted by the LOGGER. For example, if ASCII operation is desired a null line (just CR-LF) transmitted on the send socket will cause the welcoming message to be sent in ASCII. The CP login procedure can then begin. If communications is desired to be carried on with EBCDIC character codes, the first byte transmitted should be the TELNET data type code for EBCDIC (X'A2'). Thereafter all communications will be in the code originally used.

The CP login procedure expects the user to enter:

LOGIN userid

where the userid specifies the desired virtual machine. CP then replies with:

ENTER PASSWORD:

followed by the EBCDIC code for bypass (x'24') which is mapped into the TELNET code hide-your-input.

The user should then enter a password. Passwords entered from the network may be different from those entered from a local terminal. The LOGGER maps network passwords into a corresponding CP password. Thus, access to an account can only be made from the network if a network password, together with a CP password and userid, is entered into a file which is read by the LOGGER. If a userid entered from the network is not in the LOGGER FILE (or if the network password does not match the one included in the file for the specified userid) the LOGGER passes an invalid userid (or

password) to CP. The CP response for an invalid userid or password is then sent to the network user.

After a password is received by CP, CP transmits the EBCDIC code for restore (X'14') which is mapped into the TELNET control noecho.

TELNET SERVER

Since the CP/CMS system operates with EBCDIC codes, ASCII codes must be translated into EBCDIC before being sent to a virtual machine. Figure 1 gives the ASCII codes and their EBCDIC mapping. When the ASCII sequence CR-LF is received, it is mapped into the EBCDIC code NL. Whenever the TELNET control NOP is included in an input string, it is mapped into an EBCDIC idle (X'17') and then removed from the string. Thus, if TELNET NOP codes are included between a CR and LF, they are removed before the CR-LF is mapped into the EBCDIC NL.

The TELNET control hide-your-input is mapped into the EBCDIC code for bypass (X'24') and the TELNET control echo is mapped into the EBCDIC control for restore (X'14'). If the TELNET control echo is received, the SERVER should send the control noecho but this feature has not yet been implemented. Instead, the TELNET control echo is mapped into the EBCDIC code X'23'. If the TELNET break is received, it is interpreted as an attention signal and the appropriate action is taken by CP or CMS.

CP/CMS is a line at a time system and expects all input to consist of lines ending with a NL code. Characters received are buffered until the newline code is received.

Since CP/CMS is also a half duplex system, characters are only examined when the system is expecting input. If the system is not expecting input, a network interrupt is required to cause the SERVER to process received characters. On receipt of a network interrupt, characters received before the TELNET data mark is received are examined and discarded, except that if a TELNET break code is found, the appropriate CP/CMS interrupt action is stimulated.

On output, EBCDIC codes are mapped into network ASCII if a mapping exists; otherwise, the codes are mapped into the TELNET control NOP. A NL code is mapped into CR-LF. The EBCDIC code for bypass maps into the TELNET control hide-your-input and the EBCDIC code for restore maps into the TELNET control noecho. Also, the code X'23' maps into the TELNET control echo and the code X'38' maps into the TELNET control break.

Since CP/CMS is a line at a time, half duplex system the TELNET control break is transmitted as an end of message signal and also as an input prompt code. If characters were output without a NL, the break, as an end of message code, indicates to the user TELNET operating on a line at a time

mode that the characters previously transmitted should be printed without waiting for the end of line sequence. If the user TELNET is also operating in a half duplex mode, the break as an input prompt indicates that the system is ready for input.

If input had been anticipated and sent by a full duplex user TELNET, the TELNET SERVER will have that input available for immediate processing. Thus, in the case of a full duplex user TELNET the break as a prompt should be ignored.

Though CP/CMS operates in a half duplex mode, it supports half duplex terminals with the reverse break feature allowing the system to abort an input mode in order to transmit a priority output message. In this situation, the TELNET SERVER transmits a TELNET SYNC. A half duplex user TELNET should interpret this by aborting the input mode, i.e., revoking a previous TELNET break which was interpreted as an input prompt.

No codes in the output character stream can cause the TELNET data mark to be transmitted.

LOGOUT

When a user logs out from his virtual machine, CP passes the equivalent of a line disconnect to the LOGGER. The LOGGER then closes the TELNET send and receive sockets.

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC
0	0	(00)	NUL	(00)	00
1	1	(01)	SOH	(01)	01
2	2	(02)	STX	(02)	02
3	3	(03)	ETX	(03)	03
4	4	(04)	EOT	(37)	55
5	5	(05)	ENQ	(2D)	45
6	6	(06)	ACK	(2E)	46
7	7	(07)	BEL	(2F)	47
8	10	(08)	BS	(16)	22
9	11	(09)	HT	(05)	05
10	12	(0A)	LF	(25)	37
11	13	(0B)	VT	(0B)	11
12	14	(0C)	FF	(0C)	12
13	15	(0D)	CR	(0D)	13
14	16	(0E)	SO	(0E)	14
15	17	(0F)	SI	(0F)	15
16	20	(10)	DLE	(10)	16
17	21	(11)	DC1	(11)	17
18	22	(12)	DC2	(12)	18
19	23	(13)	DC3	(13)	19
20	24	(14)	DC4	(3C)	60
21	25	(15)	NAK	(3D)	61
22	26	(16)	SYN	(32)	50
23	27	(17)	ETB	(26)	38
24	30	(18)	CAN	(18)	24
25	31	(19)	EM	(19)	25
26	32	(1A)	SUB	(3F)	63
27	33	(1B)	CTL	(27)	39
28	34	(1C)	FS	(1C)	28
29	35	(1D)	GS	(1D)	29
30	36	(1E)	RS	(1E)	30
31	37	(1F)	US	(1F)	31

ASCII/EBCDIC Code Mappings
FIGURE 1

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC
32	40	(20)	SP	(40)	64
33	41	(21)	!	(5A)	90
34	42	(22)	"	(7F)	127
35	43	(23)	#	(7B)	123
36	44	(24)	$	(5B)	91
37	45	(25)	%	(6C)	108
38	46	(26)	&	(50)	80
39	47	(27)	'	(7D)	124
40	50	(28)	(	(4D)	77
41	51	(29)	)	(5D)	93
42	52	(2A)	*	(5C)	92
43	53	(2B)	+	(4E)	78
44	54	(2C)	,	(6B)	109
45	55	(2D)	-	(60)	96
46	56	(2E)	.	(4B)	75
47	57	(2F)	/	(61)	97
48	60	(30)	0	(F0)	240
49	61	(31)	1	(F1)	241
50	62	(32)	2	(F2)	242
51	63	(33)	3	(F3)	243
52	64	(34)	4	(F4)	244
53	65	(35)	5	(F5)	245
54	66	(36)	6	(F6)	246
55	67	(37)	7	(F7)	247
56	70	(38)	8	(F8)	248
57	71	(39)	9	(F9)	249
58	72	(3A)	:	(7A)	122
59	73	(3B)	;	(5E)	94
60	74	(3C)	<	(4C)	76
61	75	(3D)	=	(7E)	126
62	76	(3E)	>	(6E)	110
63	77	(3F)	?	(6F)	111

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC	
64	100	(40)	@	(7C)	124	
65	101	(41)	A	(C1)	193	
66	102	(42)	B	(C2)	194	
67	103	(43)	C	(C3)	195	
68	104	(44)	D	(C4)	196	
69	105	(45)	E	(C5)	197	
70	106	(46)	F	(C6)	198	
71	107	(47)	G	(C7)	199	
72	110	(48)	H	(C8)	200	
73	111	(49)	I	(C9)	201	
74	112	(4A)	J	(D1)	209	
75	113	(4B)	K	(D2)	210	
76	114	(4C)	L	(D3)	211	
77	115	(4D)	M	(D4)	212	
78	116	(4E)	N	(D5)	213	
79	117	(4F)	O	(D6)	214	
80	120	(50)	P	(D7)	215	
81	121	(51)	Q	(D8)	216	
82	122	(52)	R	(D9)	217	
83	123	(53)	S	(E2)	226	
84	124	(54)	T	(E3)	227	
85	125	(55)	U	(E4)	228	
86	126	(56)	V	(E5)	229	
87	127	(57)	W	(E6)	230	
88	130	(58)	8	(E7)	231	
89	131	(59)	Y	(E8)	232	
90	132	(5A)	Z	(E9)	233	
91	133	(5B)	[	(AD)	173	
92	134	(5C)	¢	(4A)	74	(BACK-SLASH)
93	135	(5D)	]	(BD)	189	
94	136	(5E)	^	(71)	113	(CARAT)
95	137	(5F)	_	(6D)	109	

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC	
96	140	(60)	`	(79)	121	(GRAVE)
97	141	(61)	a	(81)	129	
98	142	(62)	b	(82)	130	
99	143	(63)	c	(83)	131	
100	144	(64)	d	(84)	132	
101	145	(65)	e	(85)	133	
102	146	(66)	f	(86)	134	
103	147	(67)	g	(87)	135	
104	150	(68)	h	(88)	136	
105	151	(69)	i	(89)	137	
106	152	(6A)	j	(91)	145	
107	153	(6B)	k	(92)	146	
108	154	(6C)	l	(93)	147	
109	155	(6D)	m	(94)	148	
110	156	(6E)	n	(95)	149	
111	157	(6F)	o	(96)	150	
112	160	(70)	p	(97)	151	
113	161	(71)	q	(98)	152	
114	162	(72)	r	(99)	153	
115	163	(73)	s	(A2)	162	
116	164	(74)	t	(A3)	163	
117	165	(75)	u	(A4)	164	
118	166	(76)	v	(A5)	165	
119	167	(77)	w	(A6)	166	
120	170	(78)	x	(A7)	167	
121	171	(79)	y	(A8)	168	
122	172	(7A)	z	(A9)	169	
123	173	(7B)	{	(8B)	139	
124	174	(7C)	|	(4F)	79	(BAR/OR)
125	175	(7D)	}	(9B)	155	
126	176	(7E)	¬	(5F)	95	(TILDE/NOT)
127	177	(7F)	DEL	(07)	7	

ASCII DEC	ASCII OCT	ASCII HEX	TELNET CONTROLS	EBCDIC HEX	EBCDIC DEC	
128	100	(80)	DATA-MARK	(80)	128	
129	101	(81)	BREAK	(38)	56	
130	102	(82)	NOP	(17)	23	IDLE
131	103	(83)	NOECHO	(14)	20	RESTORE
132	104	(84)	ECHO	(23)	35	
133	105	(85)	HIDE-YOUR-INPUT	(24)	36	BYPASS

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)

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Postel

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Use of the hide-your-input and noecho TELNET controls are used for the EBCDIC print suppress (bypass) and print restore features during the login procedure. To support half duplex terminals, the TELNET control break (reverse break) is sent as an input prompt when input is desired. This code can also be used to indicate that a previous line sent without an end of line sequence (CR-LF) should be printed.

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will be transmitted by the LOGGER. For example, if ASCII operation is desired a null line (just CR-LF) transmitted on the send socket will cause the welcoming message to be sent in ASCII. The CP login procedure can then begin. If communications is desired to be carried on with EBCDIC character codes, the first byte transmitted should be the TELNET data type code for EBCDIC (X'A2'). Thereafter all communications will be in the code originally used.

The CP login procedure expects the user to enter:

LOGIN userid

where the userid specifies the desired virtual machine. CP then replies with:

ENTER PASSWORD:

followed by the EBCDIC code for bypass (x'24') which is mapped into the TELNET code hide-your-input.

The user should then enter a password. Passwords entered from the network may be different from those entered from a local terminal. The LOGGER maps network passwords into a corresponding CP password. Thus, access to an account can only be made from the network if a network password, together with a CP password and userid, is entered into a file which is read by the LOGGER. If a userid entered from the network is not in the LOGGER FILE (or if the network password does not match the one included in the file for the specified userid) the LOGGER passes an invalid userid (or

password) to CP. The CP response for an invalid userid or password is then sent to the network user.

After a password is received by CP, CP transmits the EBCDIC code for restore (X'14') which is mapped into the TELNET control noecho.

TELNET SERVER

Since the CP/CMS system operates with EBCDIC codes, ASCII codes must be translated into EBCDIC before being sent to a virtual machine. Figure 1 gives the ASCII codes and their EBCDIC mapping. When the ASCII sequence CR-LF is received, it is mapped into the EBCDIC code NL. Whenever the TELNET control NOP is included in an input string, it is mapped into an EBCDIC idle (X'17') and then removed from the string. Thus, if TELNET NOP codes are included between a CR and LF, they are removed before the CR-LF is mapped into the EBCDIC NL.

The TELNET control hide-your-input is mapped into the EBCDIC code for bypass (X'24') and the TELNET control echo is mapped into the EBCDIC control for restore (X'14'). If the TELNET control echo is received, the SERVER should send the control noecho but this feature has not yet been implemented. Instead, the TELNET control echo is mapped into the EBCDIC code X'23'. If the TELNET break is received, it is interpreted as an attention signal and the appropriate action is taken by CP or CMS.

OOPS

CP/CMS is a line at a time system and expects all input to consist of lines ending with a NL code. Characters received are buffered until the newline code is received.

Since CP/CMS is also a half duplex system, characters are only examined when the system is expecting input. If the system is not expecting input, a network interrupt is required to cause the SERVER to process received characters. On receipt of a network interrupt, characters received before the TELNET data mark is received are examined and discarded, except that if a TELNET break code is found, the appropriate CP/CMS interrupt action is stimulated.

On output, EBCDIC codes are mapped into network ASCII if a mapping exists; otherwise, the codes are mapped into the TELNET control NOP. A NL code is mapped into CR-LF. The EBCDIC code for bypass maps into the TELNET control hide-your-input and the EBCDIC code for restore maps into the TELNET control noecho. Also, the code X'23' maps into the TELNET control echo and the code X'38' maps into the TELNET control break.

Since CP/CMS is a line at a time, half duplex system the TELNET control break is transmitted as an end of message signal and also as an input prompt code. If characters were output without a NL, the break, as an end of message code, indicates to the user TELNET operating on a line at a time

mode that the characters previously transmitted should be printed without waiting for the end of line sequence. If the user TELNET is also operating in a half duplex mode, the break as an input prompt indicates that the system is ready for input.

If input had been anticipated and sent by a full duplex user TELNET, the TELNET SERVER will have that input available for immediate processing. Thus, in the case of a full duplex user TELNET the break as a prompt should be ignored.

Though CP/CMS operates in a half duplex mode, it supports half duplex terminals with the reverse break feature allowing the system to abort an input mode in order to transmit a priority output message. In this situation, the TELNET SERVER transmits a TELNET SYNC. A half duplex user TELNET should interpret this by aborting the input mode, i.e., revoking a previous TELNET break which was interpreted as an input prompt.

No codes in the output character stream can cause the TELNET data mark to be transmitted.

LOGOUT

When a user logs out from his virtual machine, CP passes the equivalent of a line disconnect to the LOGGER. The LOGGER then closes the TELNET send and receive sockets.

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC
0	0	(00)	NUL	(00)	00
1	1	(01)	SOH	(01)	01
2	2	(02)	STX	(02)	02
3	3	(03)	ETX	(03)	03
4	4	(04)	EOT	(37)	55
5	5	(05)	ENQ	(2D)	45
6	6	(06)	ACK	(2E)	46
7	7	(07)	BEL	(2F)	47
8	10	(08)	BS	(16)	22
9	11	(09)	HT	(05)	05
10	12	(0A)	LF	(25)	37
11	13	(0B)	VT	(0B)	11
12	14	(0C)	FF	(0C)	12
13	15	(0D)	CR	(0D)	13
14	16	(0E)	SO	(0E)	14
15	17	(0F)	SI	(0F)	15
16	20	(10)	DLE	(10)	16
17	21	(11)	DC1	(11)	17
18	22	(12)	DC2	(12)	18
19	23	(13)	DC3	(13)	19
20	24	(14)	DC4	(3C)	60
21	25	(15)	NAK	(3D)	61
22	26	(16)	SYN	(32)	50
23	27	(17)	ETB	(26)	38
24	30	(18)	CAN	(18)	24
25	31	(19)	EM	(19)	25
26	32	(1A)	SUB	(3F)	63
27	33	(1B)	CTL	(27)	39
28	34	(1C)	FS	(1C)	28
29	35	(1D)	GS	(1D)	29
30	36	(1E)	RS	(1E)	30
31	37	(1F)	US	(1F)	31

ASCII/EBCDIC Code Mappings
FIGURE 1

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC
32	40	(20)	SP	(40)	64
33	41	(21)	!	(5A)	90
34	42	(22)	"	(7F)	127
35	43	(23)	#	(7B)	123
36	44	(24)	$	(5B)	91
37	45	(25)	%	(6C)	108
38	46	(26)	&	(50)	80
39	47	(27)	'	(7D)	124
40	50	(28)	(	(4D)	77
41	51	(29)	)	(5D)	93
42	52	(2A)	*	(5C)	92
43	53	(2B)	+	(4E)	78
44	54	(2C)	,	(6D)	109
45	55	(2D)	-	(60)	96
46	56	(2E)	.	(4B)	75
47	57	(2F)	/	(61)	97
48	60	(30)	0	(F0)	240
49	61	(31)	1	(F1)	241
50	62	(32)	2	(F2)	242
51	63	(33)	3	(F3)	243
52	64	(34)	4	(F4)	244
53	65	(35)	5	(F5)	245
54	66	(36)	6	(F6)	246
55	67	(37)	7	(F7)	247
56	70	(38)	8	(F8)	248
57	71	(39)	9	(F9)	249
58	72	(3A)	:	(7A)	122
59	73	(3B)	;	(5E)	94
60	74	(3C)	<	(4C)	76
61	75	(3D)	=	(7E)	126
62	76	(3E)	>	(6E)	110
63	77	(3F)	?	(6F)	111

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC	
64	100	(40)	@	(7C)	124	
65	101	(41)	A	(C1)	193	
66	102	(42)	B	(C2)	194	
67	103	(43)	C	(C3)	195	
68	104	(44)	D	(C4)	196	
69	105	(45)	E	(C5)	197	
70	106	(46)	F	(C6)	198	
71	107	(47)	G	(C7)	199	
72	110	(48)	H	(C8)	200	
73	111	(49)	I	(C9)	201	
74	112	(4A)	J	(D1)	209	
75	113	(4B)	K	(D2)	210	
76	114	(4C)	L	(D3)	211	
77	115	(4D)	M	(D4)	212	
78	116	(4E)	N	(D5)	213	
79	117	(4F)	O	(D6)	214	
80	120	(50)	P	(D7)	215	
81	121	(51)	Q	(D8)	216	
82	122	(52)	R	(D9)	217	
83	123	(53)	S	(E2)	226	
84	124	(54)	T	(E3)	227	
85	125	(55)	U	(E4)	228	
86	126	(56)	V	(E5)	229	
87	127	(57)	W	(E6)	230	
88	130	(58)	8	(E7)	231	
89	131	(59)	Y	(E8)	232	
90	132	(5A)	Z	(E9)	233	
91	133	(5B)	[	(AD)	173	
92	134	(5C)	⌀	(4A)	74	(BACK-SLASH)
93	135	(5D)	]	(BD)	189	
94	136	(5E)	^	(71)	113	(CARAT)
95	137	(5F)	_	(6D)	109	

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)

ASCII DEC	ASCII OCT	ASCII HEX	SYMBOLS	EBCDIC HEX	EBCDIC DEC	
96	140	(60)	`	(79)	121	(GRAVE)
97	141	(61)	a	(81)	129	
98	142	(62)	b	(82)	130	
99	143	(63)	c	(83)	131	
100	144	(64)	d	(84)	132	
101	145	(65)	e	(85)	133	
102	146	(66)	f	(86)	134	
103	147	(67)	g	(87)	135	
104	150	(68)	h	(88)	136	
105	151	(69)	i	(89)	137	
106	152	(6A)	j	(91)	145	
107	153	(6B)	k	(92)	146	
108	154	(6C)	l	(93)	147	
109	155	(6D)	m	(94)	148	
110	156	(6E)	n	(95)	149	
111	157	(6F)	o	(96)	150	
112	160	(70)	p	(97)	151	
113	161	(71)	q	(98)	152	
114	162	(72)	r	(99)	153	
115	163	(73)	s	(A2)	162	
116	164	(74)	t	(A3)	163	
117	165	(75)	u	(A4)	164	
118	166	(76)	v	(A5)	165	
119	167	(77)	w	(A6)	166	
120	170	(78)	x	(A7)	167	
121	171	(79)	y	(A8)	168	
122	172	(7A)	z	(A9)	169	
123	173	(7B)	{	(8B)	139	
124	174	(7C)	|	(4F)	79	(BAR/OR)
125	175	(7D)	}	(9B)	155	
126	176	(7E)	¬	(5F)	95	(TILDE/NOT)
127	177	(7F)	DEL	(07)	7	

ASCII DEC	ASCII OCT	ASCII HEX	TELNET CONTROLS	EBCDIC HEX	EBCDIC DEC	
128	100	(80)	DATA-MARK	(80)	128	
129	101	(81)	BREAK	(38)	56	
130	102	(82)	NOP	(17)	23	IDLE
131	103	(83)	NOECHO	(14)	20	RESTORE
132	104	(84)	ECHO	(23)	35	
133	105	(85)	HIDE-YOUR-INPUT	(24)	36	BYPASS

ASCII/EBCDIC Code Mappings
FIGURE 1 (CONTINUED)